Comments to the paper: "A dense MEMS-based seismic network in populated areas: rapid estimation of exposure maps in Trentino (NE Italy)" by Scafidi et al.

This article presents the integration 76 low-cost accelerometer nodes into the existing permanent seismic network managed by the Autonomous Province of Trento. The purpose is to establish a denser seismic network that covers the whole Trentino area for a real-time monitoring and automatic generation of exposure maps. Indeed, the emphasis in the paper is the rapid estimation of exposure maps in Trentino.

The paper is certainly of interest, since at present it probably constitutes the first example in Italy of integration between a dense regional MEMS accelerometric network and a highly sensitive permanent network.

However, in its present form, the paper is lacking of some information and details which are important for the reader in order to evaluate the robustness of the results and conclusions. Therefore I suggest major revisions.

In general, I agree with the statements made in paragraph 4 "Summary and results" regarding the applicability of these very inexpensive MEMS for creating dense seismic monitoring networks also in urban environments. Although, I think that in this kind of networks can be useful deploying MEMS with different performance levels, where a percentage of the MEMS must have higher sensitivity and an ultra-low noise density (< 1 µg/ Hz).

English seems to be acceptable, but, because I am not a natural English speaker, I recommend to the Editorial Office to revise it.

Some specific comments:

I believe it is important to indicate in the paper when the network with 76 MEMS accelerometers began to work (fig. 1 reports 76 stations at 2023), as well as how many stations were present during the previous years. In the paper is reported only one example of earthquake referred to the 10 November 2022 event of ML 2.7.

Therefore, I would like to know if the event reported was really the only earthquake that the MEMS network detected throughout 2022 and 2023. As described in Cascone et al. (2021, *The Seismic Record. 1,20–26*) the ASX1000 has potential sensitivity to record local events with magnitude Mw > 2.5 in the 2–10 Hz frequency range. In the results they reported that the installed ASX1000 were able to detect nine small local earthquakes with 2.0 < ML < 3.0 between April 2020 and February 2021.

In Patanè et al. (2022, *Remote Sens., 14, 2583*) has been shown that the ADXL355 (about the ADXL355 see the next comments on paragraph 2.1) doesn't have a good signal-to-noise ratio for acceleration less than 1 cm/s^2. However, it is still possible to identify earthquakes with magnitudes less than 2.5 that happen less than 15 km away and determine the value of PGA.

Therefore, considering the density of accelerometric stations deployed in Trentino, **it would be useful to show some additional examples of earthquakes, if they are available, even if they have low magnitudes and recorded at few or at one station.**

Paragraph 2.1

In this paragraph, the authors provide information on the ASX1000, a low-cost MEMS sensor. It is said that the design and production of this sensor is owned by AD.EL. s.r.l. However, it may be more correct to state that Adel developed the board for housing and operating the MEMS accelerometer. This because the ADEL Srl does not manufacture MEMS sensors.

In the first instance, viewing the characteristics (noise floor of 25 µg/ Hz, sensitivity of 3.9 µg/LSB and bandwidth of 62.5 Hz at 250 Hz) reported in both the paper and the work of Cascone et al 2021, I supposed that the acceleremoter was a ADXL355 of the Analog Device. After that, I spoke with the ADEL and the technician sent me the information on the MEMS used in the ASX1000, which is, in fact, an ADXL355.

Occur to consider, however, that the sensor not supports also ±1 g, as erroneously written in the paper.

Furthermore, it is important to provide the necessary information regarding the ASX1000 board on which the MEMS is installed (e.g., if an SBC or MCU is present for data management, how the SeedLink protocol is implemented, how temporization is performed, etc.).

In figure 5, I note several problems. In particular, there is a shift in the noise floor curve of the ASX1000 and in the representative spectra responses of earthquakes for different moment magnitudes (dashed lines) measured at 10 km from the epicentre, with respect to the same curves reported in fig. 1 of Cascone et al. (2021), but also, for the representative response spectra, with those reported in fig. 2 of the paper of Nof et al. 2019 (*Earthquake Spectra, Volume 35, No. 1, pages 21–38*).

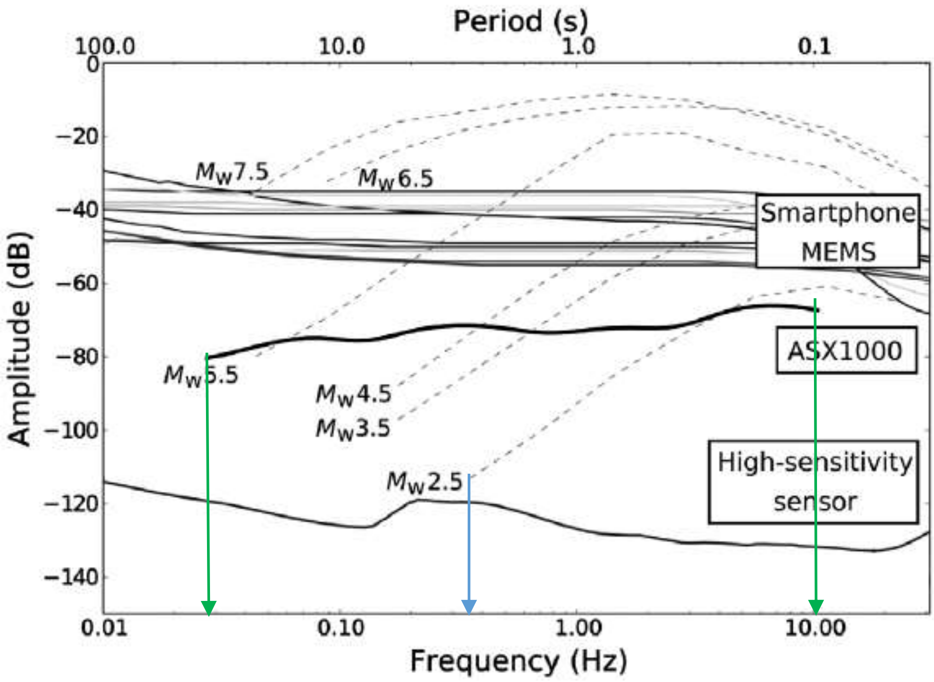

Fig. 1 – Cascone et al. 2021

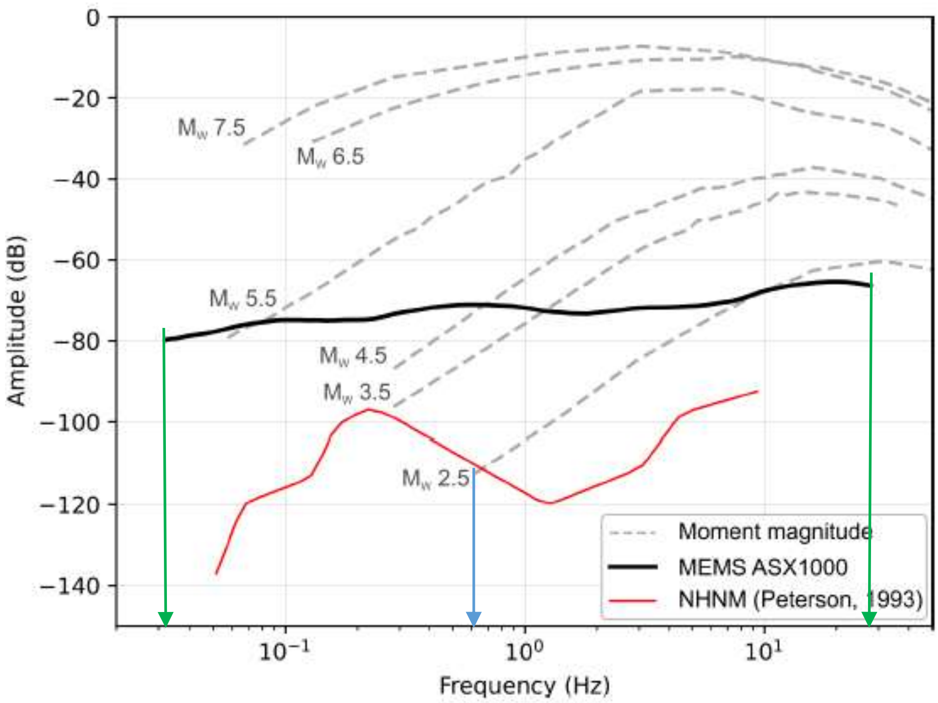

Fig. 5 – Scafidi et al. 2023 present work

I suggest that the authors carefully review Figure 5.

Paragraph 2.2

In the paragraph 2.2 the authors report that the data are managed by a software package, called CASP (Complete Automatic Seismic Processor).

The authors should provide some details on the data transmission from the 76 installed MEMS stations to the central processing center that utilizes CASP. The delay associated with data transmission and the rate of data loss are examples of factors that can impact the efficiency and reliability of network and data availability itself. **I suggest that the authors include a figure showing a Gantt chart, in terms of working and not working, for the 76 accelerometric stations during their period of operation.**

Paragraph 2.3

Concerning the calculation of automatically exposure maps the authors used the empirical relationship of Faenza and Michelini (2010) to convert in intensity values.

There is a new empirical relation for Italy by Oliveti, Faenza and Michelini (2022). Therefore, I think that this one should be considered instead of Faenza and MIchelini (2010).

Paragraph 3.

In this paragraph the authors test the procedure of seismic shaking exposure considering a realistic emergency scenario for a moderate event, simulating an ML 5.8 earthquake in Southern Trentino (45.834 °N latitude, 11.066 °E longitude, 9.0 km depth), considering that it will represents a reference for the seismic potential of the Trentino region.

How did the authors perform the numerical simulation? Which algorithm was used? Which source, path, and attenuation parameters were applied? It is important that the authors describe a comprehensive detail of the numerical simulations, since the above factors significantly influence the final results and the measured ground motion.

In conclusion, my final recommendation is to perform a major revision. I think that the topic covered by the work is interesting and the authors could make it a lot better.